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must be briefly described. It appears as a minute body in the situation previously occupied by the central spindle of the final mitosis, and consequently far removed from the blepharoplast, which lies near the polar region of the spindle, with the nucleus between them. This structure is the "Nebenkern" of other authors. The "Nebenkern" later occupies various situations in the cell, but always remains as a small structure and does not enter into the construction of the spiral body of the sperm; it finally comes to lie in the cytoplasm which becomes attached, as a vesicle, to the posterior coil of the mature sperm.

Yamanouchi's results on *Nephrodium* are opposed to those of Belajeff for *Marsilia*, who holds that the blepharoplasts like centrosomes occupy the poles of the spindle and are derived from centrosomes in a previous mitosis within the antheridium. The account agrees with Webber's conclusions for *Zamia* that the blepharoplast arises *de novo* in the cytoplasm, and also with Shaw's view for *Marsilia* that the blepharoplast has no genetic relation to the pole of the spindle in the final mitosis.

It seems probable that the centrosome theory of the blepharoplast, as held by Belajeff, Ikeno and others, has placed undue emphasis on the proximity of the blepharoplasts, in the types studied, to the poles of a closely associated mitosis. There are no mitoses present during the entire period of zoospore formation in *Derbesia*, which consequently offers important evidence against this view. Since similar conditions are also present during zoospore formation in *Edogonium* and a number of other algæ, the investigation of these types is likely to prove very interesting. The blepharoplast unquestionably gives a marked polarity to the cell, but it has not yet been established that this polar organization is derived, as such, from the immediate cell progenitors, however pleasing, for theoretical reasons, would be the establishment of such a history.

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## ORNITHOLOGY

**Riddle on the Genesis of Fault-bars and the Cause of Alternation of Light and Dark Bars in Feathers.**<sup>1</sup>—In a much shorter paper

<sup>1</sup>Riddle, Oscar. The Genesis of Fault-bars in Feathers and the Cause of Alternation of Light and Dark Fundamental Bars. *Biological Bulletin*, Vol. XIV, No. 6, May, 1908, pp. 328-370, pls. xii-xv.

published in February, 1907, under the title "A Study of Fundamental Bars in Feathers" (*Biol. Bull.*, XII, 1907, pp. 165-174) the author gave a résumé of the results of studies here extended and for the first time fully set forth. The existence of "fundamental bars" in feathers was discovered by Whitman in the summer of 1902 (not published till 1907), who found them "to be common to all species of pigeons and birds in general," and that they "appear to mark all feathers of all species of birds."<sup>2</sup> The present research was undertaken at Professor Whitman's suggestion, whose observations furnished the starting point for these studies. These are: "First, there is in all feathers a 'fundamental barring' of the whole length of the feather; second, certain defects (fault-bars) occasionally appear in the plumages of birds reared under adverse conditions." The fault-bars are considered as regards (1) their morphology, (2) their extent and distribution, (3) their cause. Whitman's suggestion that fault-bars are due to malnutrition has been abundantly proved by experimental research. While normally due to lack of nutrition, they may be produced by feeding birds on Sudan III, by mechanical injury of the feather germs, by bad sanitation, parasites, etc., and by the use of amyl nitrite to reduce blood-pressure. From extended observation and experiment it has been determined that "fault-bars are normally laid down at night," when the blood-pressure is normally low. The interrelated facts bearing upon this assumption are thus stated: "(1) Diminished feeding of birds produces emphasized fault-bars. (2) Artificially reduced (amyl nitrite) blood-pressures produce equivalent defects. (3) The fault-bars are produced at night. (5) The lowest daily temperature in birds occurs from 1:00 A.M. to 5:00 A.M. (6) Other physiological conditions of the bird seem to be favorable at night for the production of low blood-pressures. (7) A lowering of the pressure would reduce the food-supply and have a tendency to produce defects."

Those parts of the feather which are grown under the poorest nutritive conditions are the so-called "fault-bars," while the intervening parts—normally the larger—are the result of the highest nutritive conditions, and form the "fundamental bars." The structurally weakened bars are also found to be less pig-

<sup>2</sup> *Bull. Wisconsin Nat. Hist. Soc.*, V, January, 1907, p. 13.

mented, although the difference in this respect between "fault-bars" and "fundamental bars" is not marked, but results in the melanin pigment being "laid down in alternating light and dark transverse bars."

Among the results summarized by the author as confirmed by or resting upon these investigations may be mentioned: The occurrence of fault-bars normally in all birds and in all feathers; they can also be produced experimentally. A daily blood-pressure rhythm with a minimum pressure between 1 and 5 A.M. "The reduced nutrition brought about daily by this minimum blood-pressure; the disadvantageous position, in relation to the blood, of the pigment and barbule elements of the feather; together with the very rapid rate at which feathers grow, furnish the complex of conditions which bring unfailingly into existence a fault-bar, and to a more or less appreciable extent a light fundamental bar, at perfectly regular intervals in the entire length of every feather formation." "The melanin pigment of the feathers of birds shows, under favorable conditions, quantitative variations of the pigment produced in response to changes in the available food supply. This is an additional evidence that this pigment is not a derivative of hæmoglobin, but of the serum or cell proteids." "These results furnish a description, in the terms of physiology, of the mechanism of the 'inheritance' of certain fundamental color-characters of all birds." "The fundamental bars furnish the starting point for all evolutionary studies on the color-characters of birds."

These investigations may well serve as the foundation for researches upon the color-characters of birds, but whether they are to throw much light upon the genesis of color patterns in plumage remains for the future to disclose. It may be noted that no reference is made in this connection to the cause of differentiation of feather structure, treated by the author in a former paper.

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## HERPETOLOGY

**Ruthven's Variations and Genetic Relationships of the Garter-snakes.**<sup>1</sup>—This paper of over two hundred pages, devoted to a

<sup>1</sup>Ruthven, Alexander G. Variations and Genetic Relationships of the Garter-snakes. *U. S. National Museum Bulletin* 61, Svo, pp. xii + 301, with 82 text figures and 1 half-tone plate. Washington, Government Printing Office, 1908.